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THE PATTERN OF LAND UTILIZATION IN LEH DISTRICT

1985 TO 2015

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ABSTRACT

With ever increasing studies on the resources available to mankind, studies on land in general and land utilization pattern in particular is no exception. The study deals with analysis regarding the evolution of the land use pattern in the district of Leh in Jammu and Kashmir State from 1985 to 2015. Percentage share of each land use, the relative changes and correlation between the classes were focussed on. The findings has it straight that on an average major land use classes such as Area not available for cultivable (63.62%) has the maximum share in the total reporting area all through 1985 to 2015, and contrary to this Fallow land (1.05%) has the minimum average share to the reporting area. The studies on percentage of the total reporting area reveals that amongst all Barren and uncultivable land (60.8%) use class has the maximum share of land in the year 2015.

KEYWORDS: Land Utilization Pattern, Leh, PRA- Percentage to Total Reporting Area & LAHDC- Ladakh Autonomous Hill Development Council

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Original Article

INTRODUCTION

Land is the most essential natural resource on which all human activities are based (National Land Use and Conservation Board, 1988). Many studies have shown that there remain only few landscapes on the earth those are still in their natural state (David, 1968). As in all other countries of the world, land in India is put to various uses. Land utilization in simple terms is distribution of the total geographical area under various uses (Manhas and Jasrotia, 2013). Land utilization is the use made of land by a human, as surveyed and mapped in a series of recognized categories. The primary use of the land is for crops, forest, pasture, mining, transportation, gardening, residential, recreational, industrial, commercial and uncultivated waste, barren and fallow land etc. The difference between land use and land utilization is important. Land use is the use actually made of any parcel of land, House, apartments and industrial location are land use categories, whereas the term residential, industrial and agricultural refers to a system of land utilization implying roads, neighbourhood retail and service activities as well as location of industries, and the carrying of agricultural pursuits. In a rural area, tree crop or row crop would identify land use, whereas orcharding, truck farming and grazing indicate a system of land utilization. The study of land utilization has economic, geographic and demographic dimensions. The utilization of the land depends upon various physical and human factors like terrain, soil, climate, population density, occupation and technological advancement of the people (Mandal,1990). The information on the land use provided by the statistical Handbook of Leh relies on 9 fold Land use classification system proposed by the Directorate of economics and statistics, Government of India. And here it's being loosely enclosed in seven classes, like Land put to non agricultural use, Barren and uncultivable land, Land under misc trees and grooves, Cultivable wasteland, Fallow land other than current fallow, Current fallow and

Net sown area. These classes are studied under as a part of the major heads such as; Area not available for cultivation, Cultivable waste land excluding fallow, Fallow land and Net area sown. Two land use categories namely; Forest and another Permanent pastures and other grazing land which falls under Cultivable wasteland excluding fallow is excluded from the analysis as there is no data available on them from the area of interest. The data has been slightly corrected and modified taking into consideration the best needed calculation before being finally analyzed upon. This includes correcting the figures of reporting area by the addition and in some case subtraction of the obvious figures of land use classes.

STUDY AREA

Leh is situated between the graticule of 32 to 36 N latitude and 75 to 80 E longitude. Almost whole of the district is mountainous with three parallel ranges namely; Zangskar Range, Ladakh Range and Karakoram Range. Ladakh region lies on the rain shadow side of the Himalayan mountain range, thus the famous Indian monsoon contributing nothing to the area. The region is often mentioned a 'Cold Desert' considering the arctic and desert type of climate. Leh district if flanked in the east by Tibet (China), west by the District of Kargil, in the north by mainland China and south by the Indian state of Himachal Pradesh. Leh as a district was carved out of Ladakh region in July 1979. It comprises of 6 Sub divisions; namely Leh, Khaltse, Nubra, Kharu, Nyoma, Durbuk and Likir, 8 Tehsils, 16 Blocks, 112 inhabited and 1 un-inhabited villages.

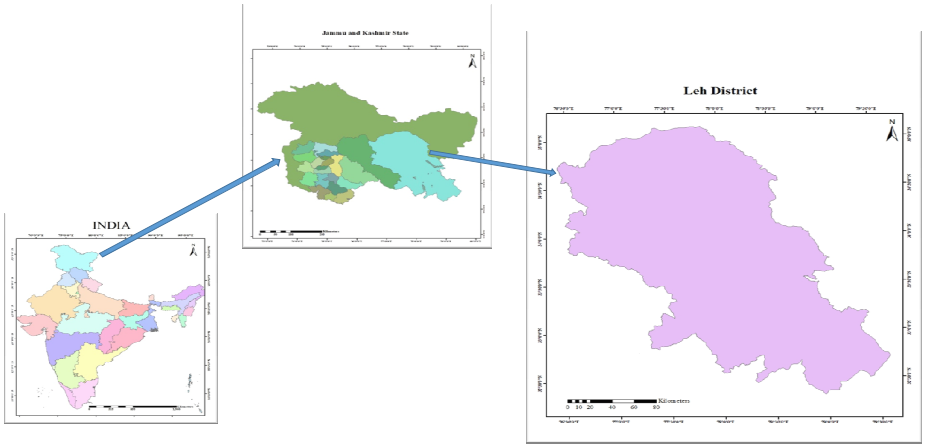


Figure 1: Location Map of the Study Area

OBJECTIVES OF THE STUDY

- To study the share of area under different land use categories in Leh district from 1985 to 2015.
- To analyze the trend of the Land utilization pattern in Leh district from 1985 to 2015.

DATA SOURCES AND METHODOLOGY

Materials

The study is based on secondary data by the District Statistical Handbook of Leh published by Directorate of Economics and Statistics, Govt. of Jammu and Kashmir.

Methods

- Percentage to the total reporting area is calculated as; (Computed by the author)

$$PRA = \frac{Area\ of\ each\ land\ use}{Total\ reporting\ area} \times 100$$

- Relative Change is calculated as;

$$Relative\ Change = \frac{\text{Value of LULC in later year} - \text{Value of LULC in base year}}{Value\ of\ LULC\ in\ base\ year} \times 100$$

- Karl Pearson coefficient of correlation

$$R = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{N\sum X^2 - (\sum X)^2}\sqrt{N\sum Y^2 - (\sum Y)^2}}$$

- Attempt is made toanalyze, correlate and interpretthe trends in the available data by applying suitable statistical and graphical representation.

RESULTS AND DISCUSSIONS

A Reporting area is an area for which data on land use classification is available. In areas where land utilization figures are based on land records, reporting area is the area in line with the village papers. These are generally the papers prepared by the village accountants or patwaris. In some cases, the village papers might not be maintained in respect of the entire area of the State concerned. For example, village papers are not prepared for the forest areas. Additionally there are tracts in many States for which no village paper exists. In such cases, ad-hoc estimates of classification of area are derived to finish the coverage.

Table 1: Land Utilization Pattern (In Hectares)

Year	Reporting Area	Area not Available for Cultivation	PRA	Cultivable Wasteland Excluding Fallow	PRA	Fallow Land	PRA	Net Area Sown	PRA
1985	44479	26789	60.2	7275	16.3	669	1.5	9746	21.9
1990	45167	28135	62.3	6643	14.7	514	1.1	9875	21.9
1995	45167	28070	62.1	6602	14.6	557	1.2	9938	22.0
2000	45167	28071	62.1	5554	12.3	398	0.9	11144	24.7
2005	51347	33586	65.4	7117	13.9	458	0.9	10186	19.8
2010	51975	34242	65.9	7119	13.7	417	0.8	10197	19.6
2015	45146	30452	67.4	4299	9.5	471	1.0	9924	22.0

Source: Statistical Handbook 1985-2015, LAHDC-Leh

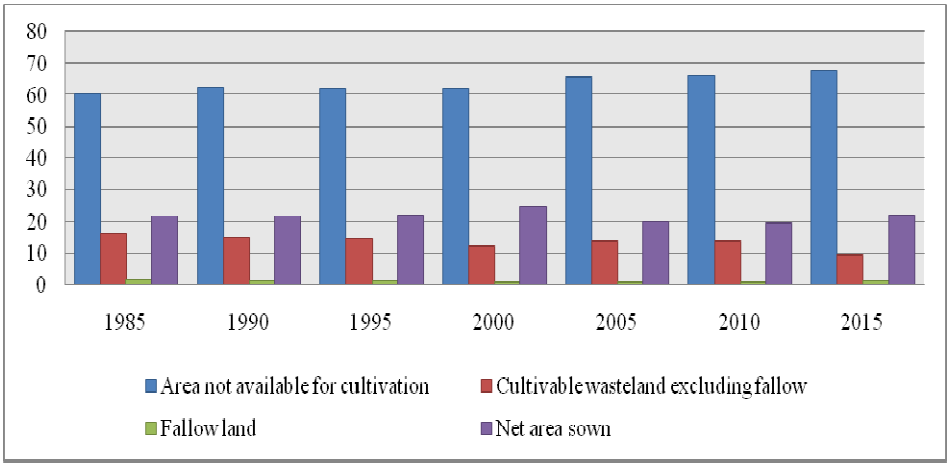


Figure 2: Land Utilization Pattern and PRA

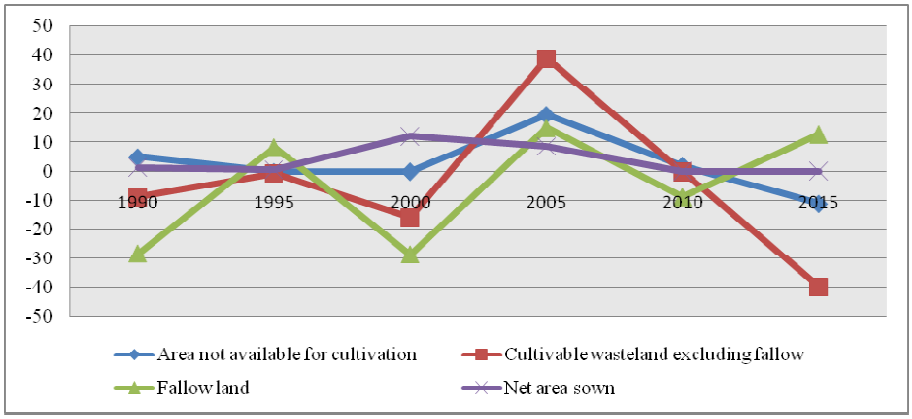


Figure 3: Relative Change of Land Utilization Pattern in Percentage

The above table deals with the PRA and relative change regarding Land utilization pattern of the Leh district. The overall maximum share of the land use class to the reporting area all through these decades was by Area not available for cultivation (67.4%) in 2015 and on the contrary the least share was witnessed in 2010 (0.8%) by Fallow land. In individual cases each land use categories have maximum to minimum share to the total reporting area. Starting with Area not available for cultivation; the land use class has its maximum was in the year 2015 (67.4%) and on the contrary the least share was witnessed in 1985 (60.2%). The report further imply that on the one hand the maximum share of the land use class of Cultivable wasteland excluding fallow was (16.3%) in 1985 and on the other the opposite was witnessed in 2015 (9.5%).

While year 1985 depicts 1.5% as Fallow lands' maximum share to the total reporting area, 2010 has its minimum share of 0.8 to the same. It findings also shows in case of Net area sown that the maximum share of the land use class was in the year 2000 (24.7%) and on the contrary the least share was witnessed in 2010 (19.6%). On an average Area not available for cultivable (63.62%) has the maximum share as land use class into the total reporting area all through 1985 to 2015, and contrary to this Fallow land (1.05%) has the minimum average share to the reporting area.

Area not Available for Cultivation

The land use category of Area not available for cultivation includes Area under non agricultural uses and Barren and uncultivable land. Area under non agricultural use includes all land occupied by buildings, roads or underwater and all land put to non agriculture use. Barren and uncultivable land on the other hand consists of all land covered by mountains, deserts. Basically these are the land that cannot be brought under cultivation except at an excessive cost.

Table 2: Area not Available for Cultivation (In Hectares)

Year	Reporting Area	Land put to non Agricultural use	PRA	Relative Change	Barren and Uncultivable Land	PRA	Relative Change
1985	44479	1806	4.1	-	24983	56.2	-
1990	45167	2280	5.0	26.2	25255	55.9	1.1
1995	45167	2902	6.4	27.3	25168	55.7	-0.3
2000	45167	2908	6.4	0.2	25163	55.7	0.0
2005	51347	7066	13.8	143.0	26520	51.6	5.4
2010	51975	7073	13.6	0.1	27160	52.2	2.4
2015	45146	2978	6.6	-57.9	27474	60.8	1.1

Source: Statistical Handbook 1985-2015, LAHDC-Leh

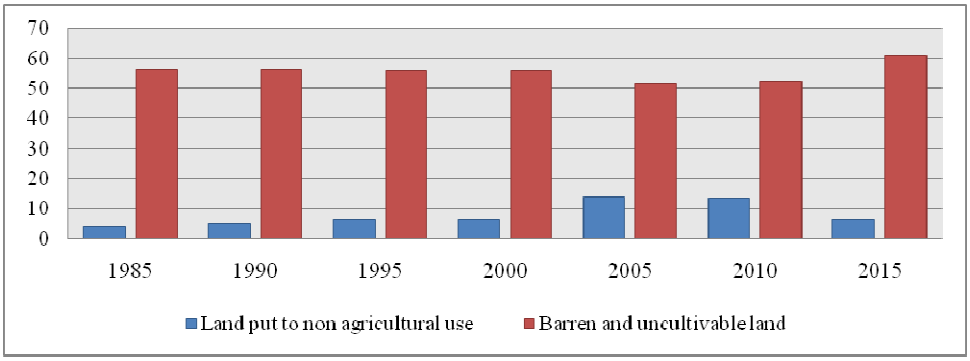


Figure 4: Area not Available for Cultivation and PRA

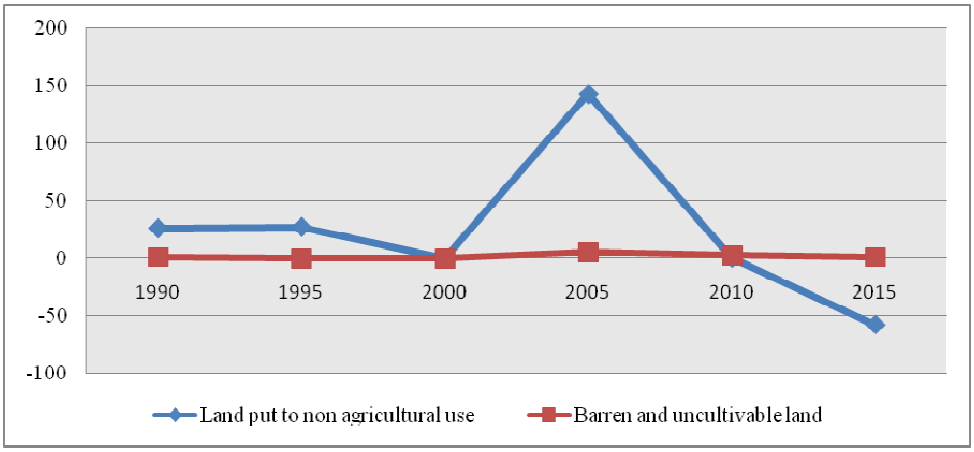


Figure 5: Relative Change of Area not Available for Cultivation in Percentage

The above table deals with the PRA and relative change regarding Area not available for cultivation. The PRA report suggest that the maximum share of the land use class of Land put to non agricultural use was in the year 2010 (13.6%) and on the contrary the least share was witnessed in 1990 (5.0%). The data on the relative change depicts a maximum rise of 142.8% in the share of Land put to non agricultural use between 2000 (0.2%) and 2005 (143.0%). Also, there was a fall of 58.0% between 2010 (0.1%) and 2015 (-57.9) in the same land use category.

According to the data on the other half of the table, the PRA data suggest that the maximum share of the land use class of Barren and uncultivable land to the total reporting area was in the year 2015 (60.8%) and on the contrary the slightest share was witnessed in 2005 (51.6%). The data on the relative change depicts a maximum though negligible rise of 5.4% in the share of the same between 2000 (0.0%) and 2005 (5.4%). Also, there was a fall of only 3% between 2005 (5.4%) and 2010 (2.4). The trend according to the analysis in case of Barren and uncultivable land is somewhat low and devoid of any significant change.

Cultivable Wasteland Excluding Fallow

Cultivable wasteland excluding fallow includes the land use category like Permanent pasture and other grazing land, Land under misc. trees and grooves and Cultivable wasteland. The first category mentioned above is not analysis since there was no separate information is available about them besides one year. Land under misc. trees and grooves comprises of land actually is used for cultivation but haven't included as a part of Net area sown. The land not included in Orchards and which is covered by trees, grasses, bamboos, bushes and grooves for fuelwood are classified under this

category.

Cultivable wasteland excluding fallow comprises of land is cultivated once or can be cultivated if tried but haven't been cultivated since five successive years including current year due to any reason. They may be reachable or unreachable and could be covered in shrubs and jungles which may lie in an isolated block or within cultivated holdings.

Table 3: Cultivable Wasteland Excluding Fallow (In Hectares)

Year	Reporting Area	Land under Misc. Trees and Grooves	PRA	Relative Change	Cultivable Wasteland	PRA	Relative Change
1985	44479	2859	6.4	-	4416	9.9	-
1990	45167	2243	5.0	-21.5	4400	9.7	-0.4
1995	45167	2196	4.9	-2.1	4406	9.7	0.1
2000	45167	1148	2.5	-47.7	4406	9.7	0
2005	51347	2652	5.2	131.0	4465	8.7	1.3
2010	51975	2621	5.0	-1.2	4498	8.6	0.7
2015	45146	1732	3.8	-33.9	2567	5.7	-42.9

Source: Statistical Handbook 1985-2015, LAHDC-Leh

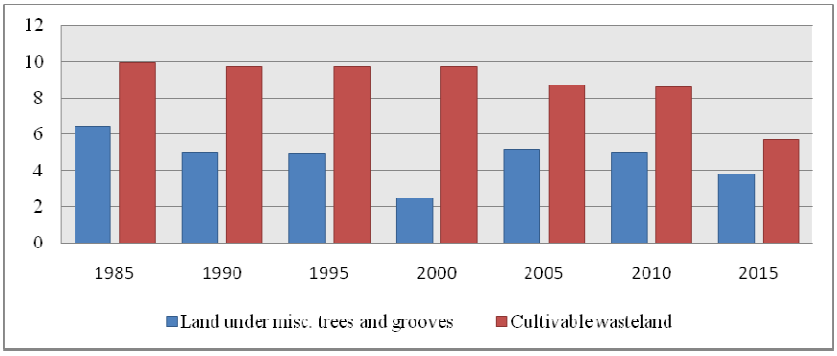


Figure 6: Cultivable Wasteland Excluding Fallow and PRA

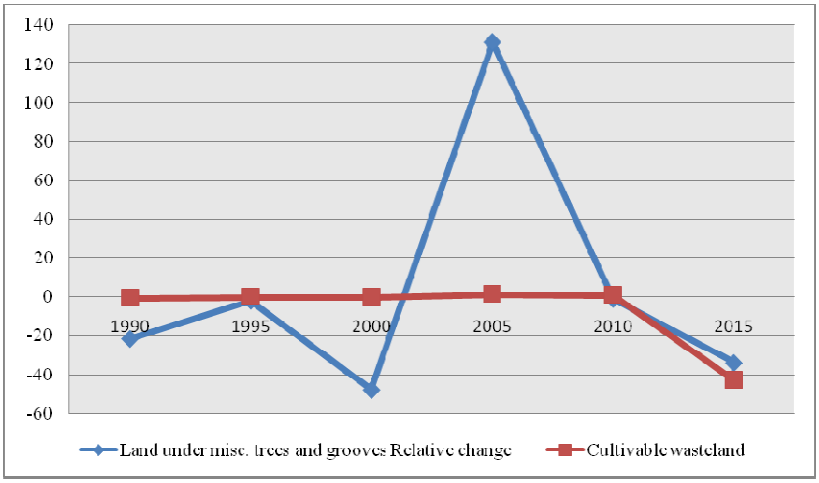


Figure 7: Relative Change of Cultivable Wasteland Excluding Fallow in Percentage

The above table deals with the PRA and relative change regarding Cultivable wasteland excluding fallow. The PRA suggest that the maximum share of the land use class of Land under misc. trees and grooves was in the year 1985 (6.4%) and on the contrary the least share was witnessed in 2000 (2.5%). The data on the relative change depicts a maximum rise of 178.7% in the share of Land under misc. trees and grooves between 2000 (-47.7%) and 2005 (131.0%). Also, there was a fall of 132.2% between 2005 (131.0%) and 2010 (-1.2) in the same.

According to the data on the other half of the table, the PRA report suggest that the maximum share of the land use class of Cultivable wasteland was in the year 1985 (9.9%) and on the contrary the least share was witnessed in 2015 (5.7%). The data on the relative change depicts a maximum rise of only 0.5% in the share of Cultivable wasteland between 1990 (-0.4%) and 1995 (0.1%). Also there was a major fall of 43.6% between 2010 (0.7%) and 2015 (-42.9) in the same category.

Fallow Land

Fallow land as a whole comprises of Fallow land other than current fallow and Current fallow. Land use class of Fallow land other than current fallow includes all land which was once cultivated but is temporarily of cultivation for a continuous period of 2 to 5 years. Current fallow on the other hand represents the cropped area left uncultivated for a year.

Table 4: Fallow Land (In Hectares)

Year	Reporting Area	Fallow Land other than Current Fallow	PRA	Relative Change	Current Fallow	PRA	Relative Change
1985	44479	106	0.2	-	563	1.3	-
1990	45167	-	-	-	514	1.1	-8.7
1995	45167	88	0.2	-	469	1.0	-8.7
2000	45167	116	0.2	31.8	282	0.6	-39.9
2005	51347	61	0.1	-47.4	397	0.7	40.8
2010	51975	59	0.1	-3.3	358	0.7	-9.8
2015	45146	32	0.1	-45.8	439	1.0	22.6

Source: Statistical Handbook 1985-2015, LAHDC-Leh

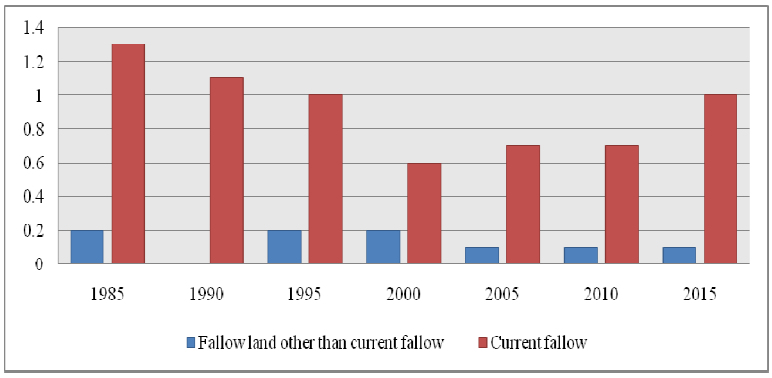


Figure 8: Fallow Land and PRA

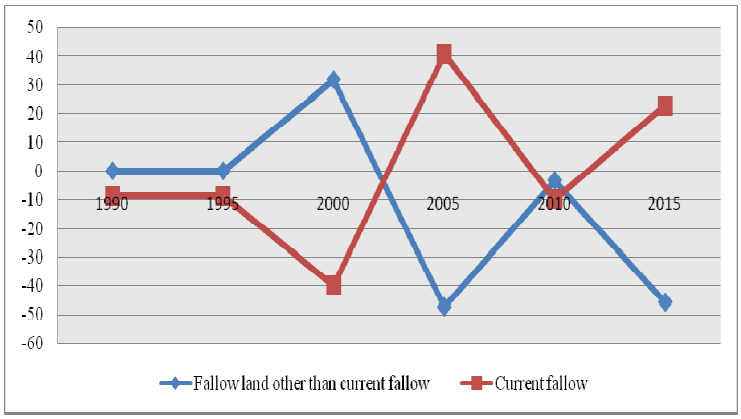


Figure 9: Relative Change of Fallow Land in Percentage

The above table deals with the PRA and relative change regarding Fallow land. The PRA data suggest that the maximum share of the land use class of Fallow land other than current fallow (0.2%) remained for three years of 1985, 1995 and 2000 and on the contrary the least share was witnessed in the following years of 2005-2015 (0.1%). The data on the relative change depicts two major fall in the share of the land use category; first being a drop of 79.2% between 2000 (31.8%) and 2005 (-47.4%) and the second drop of 42.5% was between 2010 (-3.31%) and 2015 (-45.8%).

According to the data on the other half of the table, the PRA report suggest that the maximum share of the land use class of Current fallow was in the year 1985 (1.3%) and on the contrary the least share was witnessed in 2000 (0.6%). The data on the relative change depicts a maximum rise of 80.7% in the share of Current fallowbetween 2000 (-39.9%)) and 2010 (40.8%). Also, there was a fall of 31.2% between 1995 (-8.7%) and 2000 (-39.9%) in the same. There is almost an opposite relationship between the two land use categories as; increase in the share of former is coupled with decrease of the later (1995- 2000) and vice versa in 2000-2001 and 2010-2015.

Table 5: Correlation between Cultivable Wasteland and Fallow Land

Cultivable Wasteland X	Fallow Land Y	X^2	Y^2	XY
7275	669	52925625	447561	4866975
6643	514	44129449	264196	34141502
6602	557	43586404	310249	3677314
5554	398	30846916	158404	2210492
7117	458	50651689	209764	3259586
7119	417	50680161	1733884	2968623
4299	471	18481401	221841	2024829
□X 44609	□Y 3484	□X^2 291301645	□Y^2 1785899	□XY 22422321

Source: Computed from the data above

R= 0.36

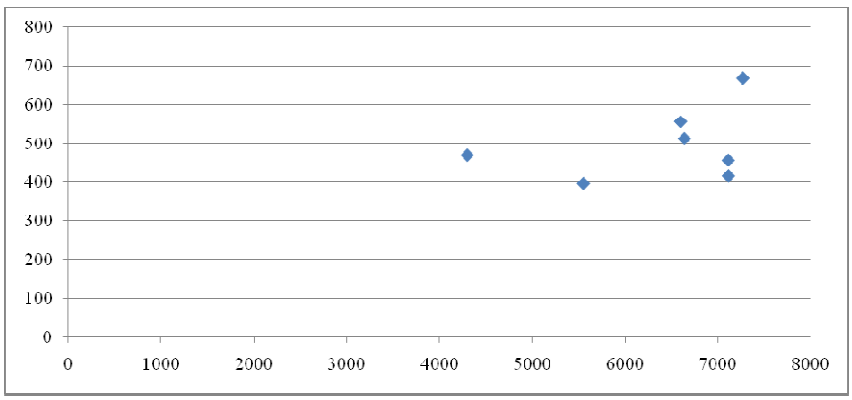


Figure 10: Scatter Diagram Depicts Correlation between Cultivable Wasteland and Fallow Land

The above data deals with correlation between Land usescategories namely; Cultivable wasteland and Fallow land. A perusal of the available data reveals that there is weal positive correlation (0.36), which means there is a negligible tendency of high X variable scores to go with high Y scores and vice versa. The Thus the correlation between Cultivable wasteland and Fallow land is positive and the magnitude of the correlation is 0.36. There has been an identical relation between the two therefore; any increase in one will lead to increase in another. The increase in Cultivable wasteland would lead to increase in Fallow land.

Net Area Sown

Net area sown represents the total land area on which crops are grown once is a year. The Net sown area and the area sown more than once a year, together makes gross cultivated area.

Table 6: Net Area Sown (In Hectares)

Year	Reporting Area	Net Area Sown	PRA	Relative Change
1985	44479	9746	21.9	-
1990	45167	9875	21.9	1.3
1995	45167	9938	22.0	0.6
2000	45167	11144	24.7	12.1
2005	51347	10186	19.8	-8.6
2010	51975	10197	19.6	0.1
2015	45146	9924	22.0	-2.7

Source: Statistical Handbook 1985-2015, LAHDC-Leh

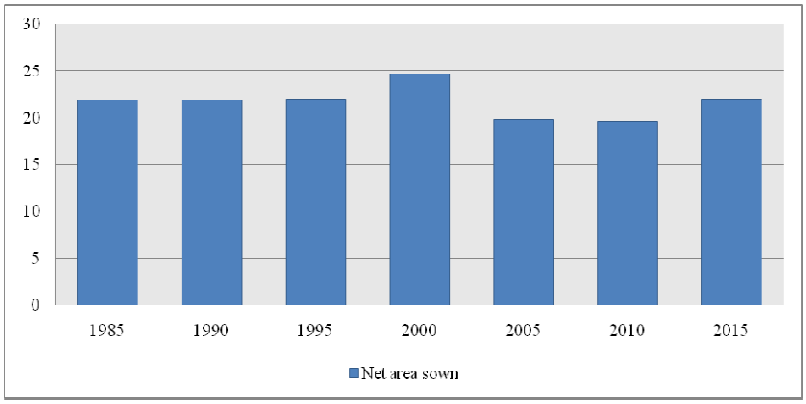


Figure 11: Net Area and PRA

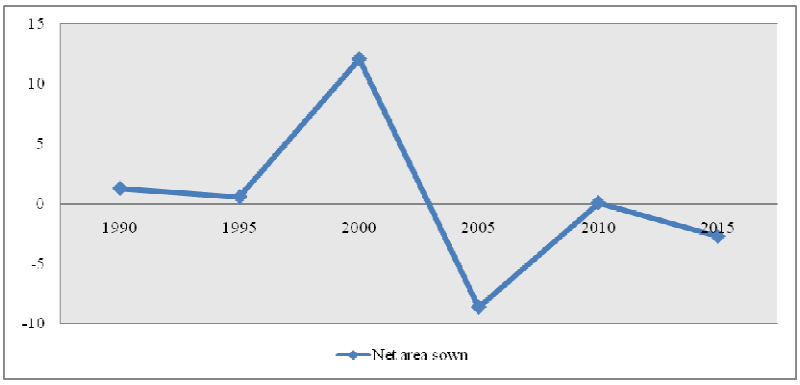


Figure 12: Relative Change of Net Area Sown in Percentage

The above table deals with the PRA and relative change regarding Net area sown. The PRA findings suggest that the maximum share of the land use class of Net area sown was in the year 2000 (24.7%) and on the contrary the least share was witnessed in 2010 (0.1%). The data on the relative change depicts a maximum rise of 11.5% in the share of Net area sown between 1995 (0.6%) and 2000 (12.1%). Also, there was a fall of 20.7% between 2000 (12.1%) and 2005 (-8.6%) in the same.

Table 7: Correlation between Fallow Land and Net Area Sown

Fallow Land X	Net Area Sown Y	X^2	Y^2	XY
669	9746	447561	94984516	6520074
514	9875	264196	97515625	5075750
557	9938	310249	98763844	5535466
398	11144	158404	124188736	4435312
458	10186	209764	103754596	4665188
417	10197	1733884	103978809	4252149
471	9924	221841	98485776	4674204
□X 3484	□Y 71010	□X^2 1785899	□Y^2 721671942	□XY 35158143

Source: Computed from the data above
R= -0.7

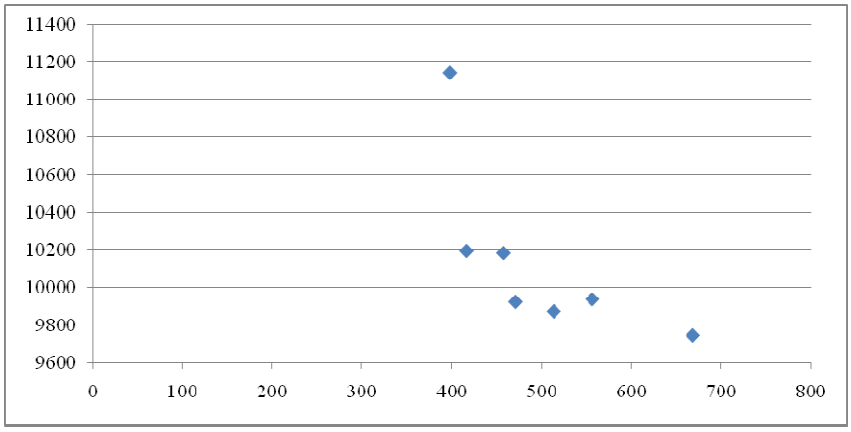


Figure 13: Scatter Diagram Depicts Correlation between Fallow Land and Net Area Sown

The above data deals with correlation between Land use classes namely; Fallow land and Net area sown. A perusal of the available data reveals that there is moderate negative correlation (-0.7), which means there is a tendency of high X variable scores to go with low Y scores and vice versa. The Thus the correlation between Fallow land and Net sown area is negative and the magnitude of the correlation is 0.7. There has been an opposite relation between the two therefore; any increase in one will lead to decrease in another. The increase in Fallow land would lead to decrease in Net area sown.

CONCLUSIONS

The land use classification studied above as mentioned earlier is actually based on the 9 fold classification system proposed by the Directorate of economics and statistics, Government of India. The most significant observation in this regard is about the Reporting area. As per general perception the reporting area should and would grow with every passage of time but interestingly there have been many ups and downs in the graph of reporting area. For example the largest reporting area till date was 51975h (2010), whereas the smallest reporting area was 44479h (1985) and likewise, the average reporting area is 46921.1h. Considering the main land use categories such as; Area not available for cultivation, Cultivable wasteland excluding fallow, Fallow land and Net sown area, the data on the relative change of On one hand Area not available for cultivation depicts a maximum rise of 19.6% between 2000 and 2005. On the other hand, a fall of 13% was witnessed between 2010 (1.9%) and 2015 (-11.1%) in the same. The data on the relative change depicts a maximum rise of 54.7% in the share of Cultivable wasteland excluding fallow between 2000 (-15.8%) and 2005 (38.9%).

Also, there was a maximum fall of 39.6% between 2010 (0%) and 2015 (-39.6%). Likewise, it depicts a maximum rise of 44% in Fallow land between 2000 (-28.5%) and 2005 (15.1%). There was also a maximum fall of 36.9% between 1995 (8.4%) and 2000 (-28.5%). Lastly, the data on the relative change portrays a maximum rise of 11.5% in the share of Net area sown between 1995 (0.6%) and 2000 (12.1%). Also, there was a fall of 20.7% between 2000 (12.1%) and 2005 (-8.6%) in the same. The study does not notice any particular trend or pattern in the land use categories. Except Cultivable wasteland and Barren and uncultivable land, all the other land use classes were very unpredictable. Any expansion in their share is found to be soon followed by the contraction, that too on a big margin.

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